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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,842	09/09/2003	Yukihisa Takeuchi	791_228	2130

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EXAMINER	
DO, AN H	
ART UNIT	PAPER NUMBER

2853

DATE MAILED: 05/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/657,842

Applicant(s)

TAKEUCHI ET AL.

Examiner

An H. Do

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 09 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-13,15-21 and 23-29 is/are rejected.
- 7) ☒ Claim(s) 3,14 and 22 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 9/9, 12/1 & 4/7/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election with traverse of Group I (Claims 1-20) in Paper filed on 07 April 2004 is acknowledged. The traversal is on the ground(s) that the subject matter of claims 1-29 is sufficiently related and that the examination of all claims could be made without serious burden. This is found persuasive and hence, the Election/Restrictions requirement is now withdrawn.

### *Priority*

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### *Information Disclosure Statement*

3. The information disclosure statements (IDS) submitted on 09 September 2003, 01 December 2003 and 07 April 2004 were filed and are being considered by the examiner.

### *Claim Rejections - 35 USC § 102*

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 2, 4-7 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Nishimura et al (US 6,437,484 B1).

Nishimura et al discloses in Figures 1-4 a piezoelectric/electrostrictive film type actuator comprising a ceramic substrate (1, 2); and a piezoelectric/electrostrictive device (3) disposed on the ceramic substrate (1, 2), and including a piezoelectric/electrostrictive film (7, 8) and electrode film (4-6) and which is driven by displacement of the piezoelectric/electrostrictive device (3), wherein piezoelectric/electrostrictive film (7, 8) and the electrode film (4, 5, 6) are alternately laminated (column 9, lines 17-20) to form the electrode film (4-6) from an uppermost layer (8) and a lowermost layer (7) possesses a plurality of layers of piezoelectric/electrostrictive films (7, 8, column 9, lines 20-25); and the piezoelectric/electrostrictive films have two to four layers (7, 8, column 9, lines 32-34).

Nishimura et al further discloses a thickness per layer of the piezoelectric/electrostrictive films is 30  $\mu\text{m}$  or less (column 9, lines 26-32); at least one layer of the piezoelectric/electrostrictive films is formed by an electrophoresis deposition method (column 10; lines 8-18); two or more piezoelectric/electrostrictive devices are arranged on the same ceramic substrate (column 3, lines 46-55); a cavity (A) is formed in an internal portion of the ceramic substrate (1, 2), and is pressurized by deforming a part of a wall (2) thereof with the piezoelectric/electrostrictive element (3); the ceramic substrate (2, 3) is formed of a material containing any of zirconium oxide, aluminum oxide, magnesium oxide, aluminum nitride, and silicon nitride (column 10, lines 22-28) as a major component;

6. Claims 1, 2, 4-13, 16-21 and 24-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Takuchi et al (US 5,592,042).

Takuchi et al discloses in Figures 1-4 and 10 a method and a piezoelectric/electrostrictive film type actuator comprising a ceramic substrate (2, column 7, lines 28-31); and a piezoelectric/electrostrictive device (Figure 6) disposed on the ceramic substrate (2), and including a piezoelectric/electrostrictive film (6, 14) and electrode film (4, 16) and which is driven by displacement of the piezoelectric/electrostrictive device (Figure 6), wherein piezoelectric/electrostrictive film (6, 14) and the electrode film (4, 16) are alternately laminated (Figure 6, column 6, lines 1-8) to form the electrode film (4) from an uppermost layer (16) and a lowermost layer (16) possesses a plurality of layers of piezoelectric/electrostrictive films (16); and the piezoelectric/electrostrictive films have two to four layers (Figure 6).

Takuchi et al further discloses a thickness per layer of the piezoelectric/electrostrictive films is 30  $\mu\text{m}$  or less (column 7, lines 39-41); at least one layer of the piezoelectric/electrostrictive films is formed by an electrophoresis deposition method (column 7, lines 54-63); two or more piezoelectric/electrostrictive devices are arranged on the same ceramic substrate (Figures 1 and 4); a cavity (column 7, lines 12-13) is formed in an internal portion of the ceramic substrate (2), and is pressurized by deforming a part of a wall (column 6, lines 14-15) thereof with the piezoelectric/electrostrictive element (6, 14); the ceramic substrate (2) is constituted of two or three laminated layers of thin plates (Figure 6); the ceramic substrate (2) is formed of a material containing any of zirconium oxide, aluminum oxide, magnesium

oxide, aluminum nitride, and silicon nitride (column 7, lines 31-39) as a major component; and the actuator can be used as an ink pump of a printer head (column 1, lines 11-19).

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 15 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takuchi et al (US 5,592,042) in view of Shimada (US 5,814,923).

Takuchi et al discloses the claimed invention except for reciting the difference between the two sintering temperatures is from 0 to 300 °C.

However, Shimada teaches the difference between the two sintering temperatures is from 0 to 300 °C (column 4, lines 29-35).

-----It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the difference between the two sintering temperatures is from 0 to 300 °C, as taught by Shimada, for the purpose of obtaining a piezoelectric film having a perovskite crystal structure as noted in column 4, lines 35-38 of Shinada.

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Qiu et al (US 6,142,615) discloses an inkjet head having a vibration plate (3) on which piezoelectric/electrostrictive devices (4) are formed by alternately laminated PZT layers (41, 42) and electrode layers (30, 40). Yun (US

6,497,019 B1) discloses an inkjet head having a diaphragm (36) on which electrode layers (38, 42) and PZT layer (40) are formed.

***Allowable Subject Matter***

10. Claims 3, 14 and 22 are objected to as being dependent upon a rejected substrate claim, but would be allowable if rewritten in independent form including all of the limitations of the substrate claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 3, 14 and 22, it is the limitation of "wherein a thickness  $t_n$  of an n-th piezoelectric/electrostrictive film from bottom in the piezoelectric/electrostrictive device satisfies the following equation:  $t_n \leq t_{n-1} \times 0.95$ ." It is these limitations found in each of the claims, as they are claimed in the combination, that has not been found, taught or suggested by the prior art of record which makes these claims allowable over the prior art.

***Contact Information***

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11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to An H. Do whose telephone number is 571-272-2143.

The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on 571-272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2853

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



An H. Do  
May 20, 2004

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